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B I U M E

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A Rose By Any Other Name...



Catching *Aedes mountaintopus* ...

A young man in a white lab coat rushed through the door of the clinic clutching a piece of paper and said to the man sitting behind the desk, "Doctor ... I've found the answer! The germ causing Bluffer's Blindness is carried by a mosquito!"

"Wonderful," replied the older man. "But tell me," he said, stroking his beard, "which mosquito carries the disease? Are all kinds of mosquitoes carriers?"

Puzzled, the young man replied, "Gee, I don't know. Is there more than one kind?"

"Why yes, of course," said the doctor. "There are 37 different species of mosquito known from this region. You'll have to find out which one is involved."

So the young technician went out and collected the mosquito and looked at it. He then picked up a dusty book from the library and flipped through the pages, looking at the pictures of the mosquitoes.

about *Aedes mountaintopus*. They said it lives in ponds in the mountains, and it breeds in late July. So,

the government of the country decided to spray all the mountain ponds with insecticide in early July.

The following year, everyone was surprised to find that Bluffer's Blindness was worse than ever, but that many useful insects and fish had been killed in the mountains. What had gone wrong? The name. The name of the mosquito was wrong.

A curious young lady in the same lab became suspicious and collected a new specimen of the guilty mosquito. She asked the librarian to help her find the newest book on identifying mosquitoes from that country. She carefully compared the specimen with the descriptions and illustrations, and concluded that it was really *Aedes riverbottomus*.

To be sure, she borrowed some reliably identified specimens from the national museum of her country and was happy to find that it was a perfect match.

The books and articles she found about *Aedes riverbottomus*

said that it live in rivers and, in late April, laid its eggs on the stems of a common grass named

Poa mosquitophilus in shallow water. The young lady got books on grasses and found out where the grass was found in that country. She then suggested to the government that they cut and remove the grass in early May before the eggs hatched. This was done and, as a result, Bluffer's Blindness all but disappeared from that country.

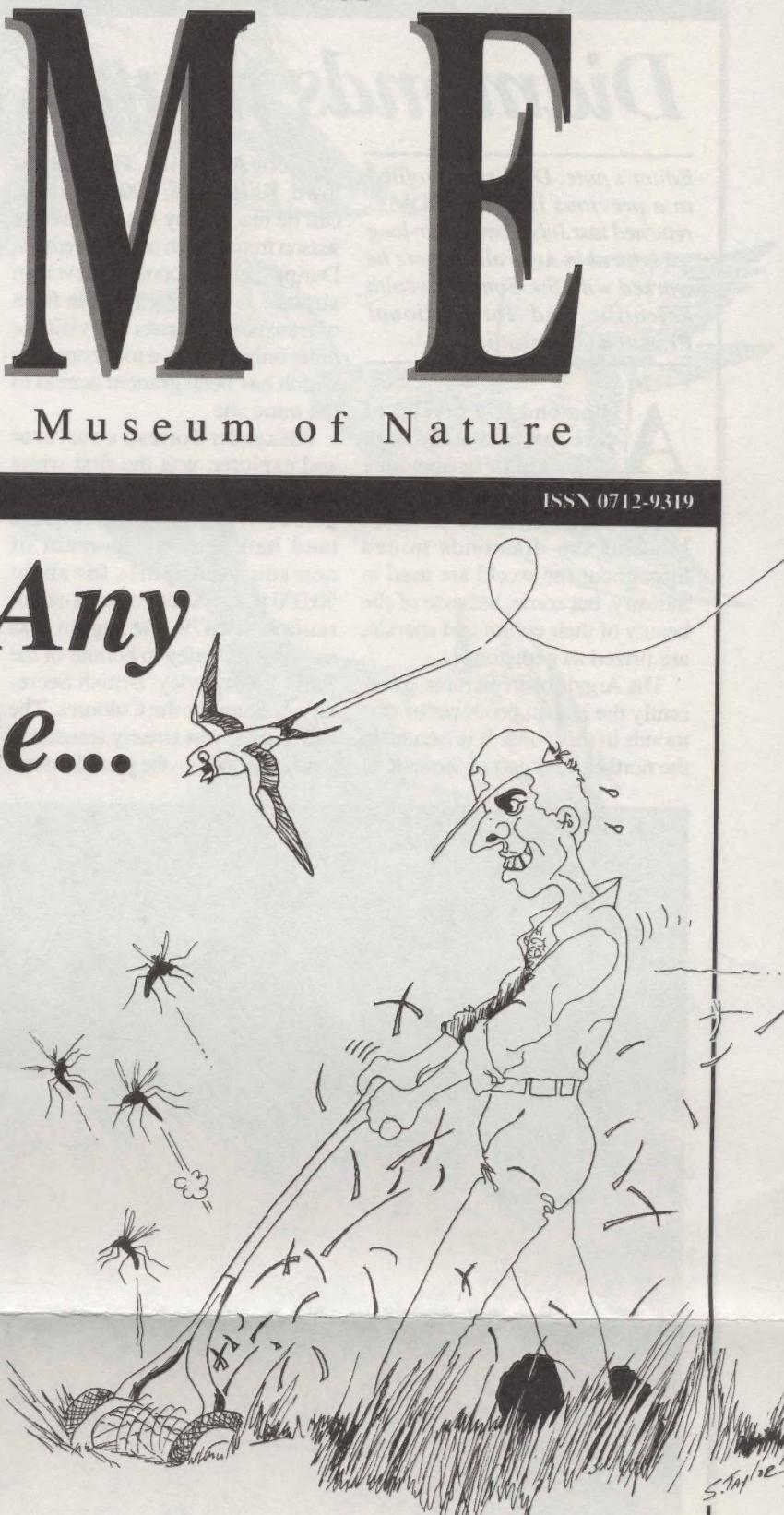
It is true that "a rose by any other name would smell as sweet" (meaning that the important thing

about a rose is that it's pretty and smells nice, not the name itself). On the other hand, if Shakespeare had been thinking about *skunk cabbage* and had called it a *rose*, the meaning of his message would have been quite different, and he would have been badly misunderstood. The name is important after all. It's important in the process of communication. Although names in themselves are unimportant, the information they carry with them can be very important. With the wrong name, you get the wrong information.

In the jungle, a mistaken identification of a berry or shrub can mean the difference between a meal and a stomach ache — or worse. Once a use or danger is discovered for a plant, it is important to share that information through a name. The name and description takes the place of a piece of the plant. Honey bees have a language that doesn't use words — or names. To tell other bees in the hive which species of flower is a good source of nectar, the bee brings back some of the nectar and "shows it around." Humans are more sophisticated. They don't have to carry the plants because the names carry the information.

Human beings are natural taxonomists. They name and classify things by instinct, from the earliest age. A child has no trouble generalizing the characteristics of a "dog" and correctly including collies, cocker spaniels and German shepherds under this name, and distinguishing them from all sorts of cats. We classify and name different kinds of clothing (casual, dress, sport, "grubbies"), restaurants (fast-food, family-type, fancy), vehicles (trucks, sedans, sports cars, vans), and so on. We like to sort things and organize what seems like a confusing jumble of different things into groups and units that are easily learned and remembered.

There are so many different kinds of natural objects, and they all have so many uses — or dangers — associated with them, it isn't surprising that systems of classification have arisen for plants, animals and minerals in all kinds of societies all over the world.



meant goodbye
Aedes riverbottomus!

At the Canadian Museum of Nature, most of the research is concerned with names and the information names carry with them. Because the Museum houses large collections of natural objects, museum scientists are able to study how certain names are applied to certain plants, animals and minerals, and to correct errors if they find them.

Based on their familiarity with a broad diversity of species in specific groups of organisms, the scientists at the Museum of Nature are also deeply interested in relationships between these species, and in their evolutionary history. This information is put together into systems of classification that summarize these relationships. Classification systems are often very important in a practical way.

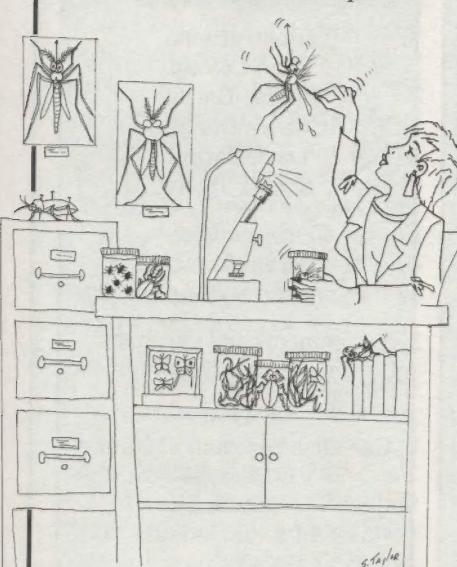
Because taxonomists know what kinds of fungi are most closely related to fungi that produce useful medicines such as antibiotics, we often can find new and even better sources of that medicine. When Sir Alexander Fleming discovered that a mould contaminating his cultures of disease-producing bacteria produced a substance that could kill those bacteria, he realized the possible benefits of the discovery. He

immediately sent the fungus to an expert for an accurate name. It turned out to be a rather uncommon fungus, *Penicillium notatum*. So Fleming called the germ-killing substance it produced penicillin. But was there a fungus that could produce even more penicillin than this one — enough to provide medicine for everyone who might need it? The search was on! One species tested was *Penicillium chrysogenum*. The reason *P. chrysogenum* was tried was that taxonomists knew it was closely related to *P. notatum* and was therefore a likely candidate for producing the same antibiotic chemical. They were right. Certain strains of *P. chrysogenum* produce many times the quantity of penicillin made by Fleming's original fungus.

It's a good thing that there are scientists in the "name business." Without them, the rich diversity of life on earth would remain unexplored, and the wonderful stories about the various plants, animals and minerals that are discovered could not be told by one interested individual to another.

Irwin M. Brodo
Botany Division

Next issue: How are names invented?



but finding its real name ...

Diamonds from Kimberley, Western Australia

Editor's note: Dr. Grice, profiled in a previous issue of BIOME, returned last July from a year-long sabbatical in Australia, where he worked with the Commonwealth Scientific and International Research Organization.

A diamond is a crystal of pure carbon that has been subjected to tremendous pressure and heat. It is the hardest natural substance found on earth. Most of the diamonds mined throughout the world are used in industry, but some, because of the beauty of their colour and sparkle, are prized as gemstones.

The Argyle open pit mine is currently the largest producer of diamonds in the world. It is located in the northeastern part of the state of

Western Australia. The nearest town, Kununurra, 200 km north, can be reached by road in the dry season from March until November. During the monsoons, however, an airplane is the only reliable form of transport. Tourists can visit the mine only through a tour company which has been granted access to the mine site.

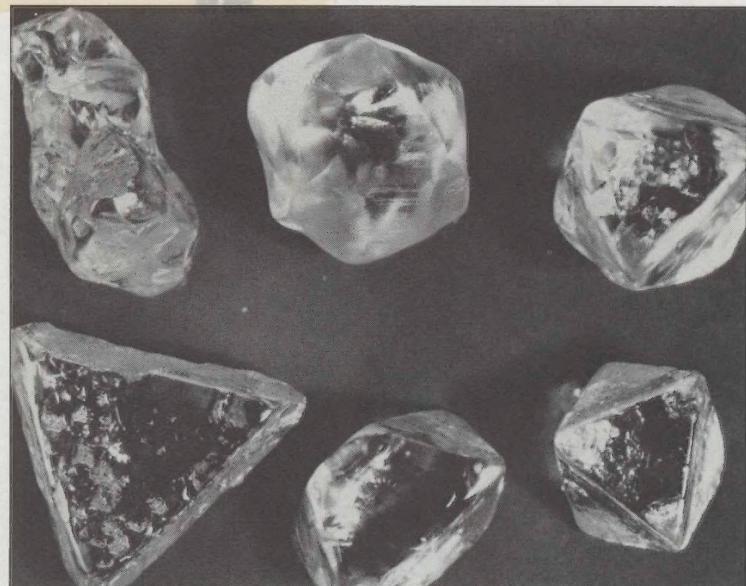
Alexander Forrest, a surveyor and explorer, was the first white man to venture into the northern part of Western Australia. This land had been the domain of nomadic Aborigines for about 50,000 years. After Forrest's explorations in 1879, the region was named Kimberley in honour of the Earl of Kimberley, British Secretary of State for the Colonies. The earl's name was already associated with diamonds — the great Kimber-

ley diamond mine in South Africa was named after the earl in 1873.

Forrest's enthusiastic reports of the area encouraged sheep farmers and cattlemen to move into the region. Today, aside from a few enormous ranches or "downs," the magnificent plains and rough ranges of exposed rock are still largely uninhabited and difficult to access.

The discovery of diamonds in the Kimberley region is quite recent. Although gold prospectors found the first diamonds in Western Australia in 1895, no systematic exploration took place until 1965. Initial searches proved disappointing, but finally in 1979 the Argyle "pipe" was discovered.

Diamonds were formed millions of years ago in molten lava. As the lava flowed toward the earth's surface, it cooled into magma which



Brian Stevenson

Argyle diamonds. Each crystal is about 1 cm.

in turn solidified into *kimberlite*, an igneous rock from deep in the earth's mantle (about 150 km below the earth's surface). *Kimberlite* intrudes the crust as small volcanic pipes, dykes and sills. It may contain diamond but only as a very rare constituent.

The name *kimberlite* was first applied to the dykes of the Kimberley mine in South Africa. Until the discovery of the Australian Kimberley deposit, diamonds found everywhere else in the world — South Africa, the Soviet Union, Brazil, Zaire, Botswana — had always been found associated with *kimberlite* rocks. The excitement of the Australian discovery was that for the first time diamonds were associated with a different rock type, *lamproite*. This rock also comes from deep in the earth's mantle and formed by the magma interacting with groundwater as it approached the surface. It occurs as pipes similar to *kimberlite* pipes, but its chemistry is distinctly different

and diamond is a much more common constituent. The discovery of diamonds in *lamproite* rocks changed diamond exploration around the world.

During 1987 more than 30 million carats were mined from the Argyle deposit at Kimberley, representing one-third of the world's total diamond production. Argyle's production is six times greater than that of the Finsch mine, South Africa's highest yielding diamond mine. Although the deposit has a very high ore grade of 6.8 carats of diamond per tonne of ore, only 5% of the Argyle diamonds are of gem quality. Gems from this area are significant because of the range and quantity of coloured stones: brown "cognac," yellow "champagne," apricot, occasionally green or blue, and rarely, the highly desirable pinks.

Joel Grice
Earth Sciences Division
(Mineralogy)



The Argyle diamond mine, Kimberley District, Western Australia.

From the Director's Desk: Who's Relative?

Where did this diversity of life come from? Did it all — the grotesque, bizarre deep-sea creatures, the exquisitely elegant, microscopic radiolarians of the plankton, and the spectacularly shimmering iridescences of birds, butterflies and fishes — have its origins in some slimy pool of goo nearly 4,000,000,000 years ago?

The pattern of gradual change through geological time — that is, evolution — is not questioned by modern scientists. None questions the notion that all life is bound by an incredible web of similarity, from the molecular to the gross anatomical level. But today there is serious disagreement about the importance of those similarities. Since Darwin's time in the mid-1800s, for nearly 150 years scientists have measured, mapped, described and analyzed the similarities and dif-

ferences between organisms to establish the relationships. Similarity — deceptively elegant and obvious — seemed to be the deciding factor. Surely the more alike two species are, the more closely related they must be.

But in 1958, Willi Henig, a German entomologist, lit a long fuse on an intellectual bombshell. The fuse took 10 years to reach the bomb, and the detonator was an English-language translation of his book.

"No! Nonsense! What rubbish!" shouted some of the scientists.

"Yes, it fits! Of course! Amazingly obvious!" shouted others.

Even today these debates rage on. What did Willi Henig say? Observing that evolution advances by inventing new structures from old ones, and that the same complex structure is unlikely to have been invented

more than once, he argued that it is *not* the sum of similarities that defines close relationships. Instead, it is the sharing of the same unique inventions that determines closeness. To add up all the similarities between two species and subtract them from the differences between them, as science used to do to create some index of closeness of relationship, is simply not instructive. In fact, said Willi Henig, a *single* unique evolutionary invention shared by two species may be so important that it overrides all other differences or similarities.

As a spectacular example of this new theory, science now asserts that crocodiles are more closely related to birds than they are to reptiles. Imagine crocodiles and pigeons more closely related than crocodiles and lizards! Does this seem like nonsense? On the surface it does. But consider that

crocodiles and birds share a remarkable invention — a four-chambered heart. It is essentially inconceivable that they could have developed this intricate and complicated structure independently of each other. They must therefore have shared the same ancestor. But none of the lizards has a four-chambered heart, so they did not share that same ancestor.

That common ancestor shared by birds and crocodiles, but not by other reptiles, means that crocodiles are closer cousins (to put it in human terms) to the birds than to the reptiles, no matter how much more they resemble the reptiles.

Alan R. Emery
Director

BIOME

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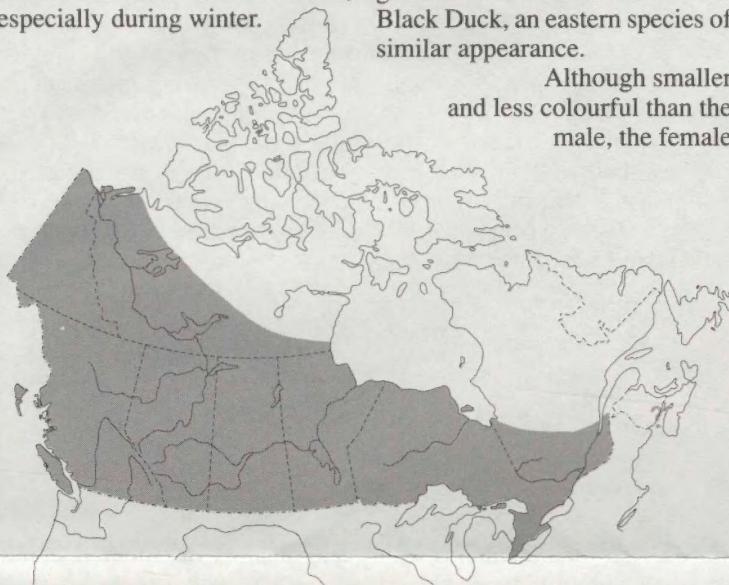
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The Mallard

In the crisp chill of an autumn morning, a prairie marsh fills with the resounding quack of a female Mallard. At a time when most ducks are silent, the voice of the Mallard (*Anas platyrhynchos*) can still be heard echoing across the water.

Mallards breed from southern Quebec to British Columbia, as well as in the Yukon and the Northwest Territories. There is also some nesting in the Maritimes, but biologists have not determined if a permanent breeding population has been established. Wintering populations in Canada are most common in southern British Columbia, southern Ontario and southwestern Quebec. Although Mallards prefer freshwater habitats, they are also seen in sheltered coastal waters, especially during winter.



Breeding distribution of Mallard.

Charles Darwin wrote that the origins of the flowering plants (angiosperms) were "an abominable mystery." Even before Darwin's time, scientists had searched for the earliest fossil evidence of flowers, but little had been found about our most diverse and widely distributed group of plants. Even though the fossil evidence was "feeble," Darwin felt that "someday the mystery would be solved."

Identifying the earliest flowering plants could provide science with answers to many important questions. Did the angiosperms evolve in the tropical regions of our earth? Or in upland, bordering environments where competition would be less, allowing a new group of plants to evolve slowly? How did the angiosperms populate the entire globe once they had evolved? What were the paths of migration? Was the earliest flower similar to today's showy magnolias and roses or was it less conspicuous, such as our maple and grass flowers? Were there more kinds of flowers than today, or are we now witnessing the full spectrum of their diversity?

Flowers are generally more delicate than leaves, seeds and pollen. They may not preserve well, or at all, in the rock layers of the earth. Flowers often wilt on the plant before falling to the ground, and a wilted flower part may be unrecognizable in the fossil record. Even so, flowers have been recovered from rock strata. In recent years,

more investigations and new examination techniques have added much new evidence about the origins of flowering plants. Complete and beautiful specimens have been discovered in England, Europe, Asia, North America and Australia. Improved techniques in microscopy, including the scanning electron microscope, have revealed the intricate details of these early, primitive flowers.

The oldest unequivocal evidence of the existence of flowers comes from pollen grains and angiosperm leaves found in Lower Cretaceous rocks, about 120 million years old. The current accepted view is that there were two approaches in the evolution of the earliest flowers. Flowers with typical petals and sepals, such as those of our present-day magnolias (see illustration), as well as more simple flowers without showy parts, such as those of our willows, ashes and maples, both have fossil records extending back at least 100 million years. The more showy ones were probably pollinated by attracting insects.

New evidence is accumulating rapidly. This February, plant scientists from Yale University reported the discovery of a small, perennial plant with attached leaves and simple non-showy flowers in rocks from Victoria, Australia. It was dated as 118 million years old.

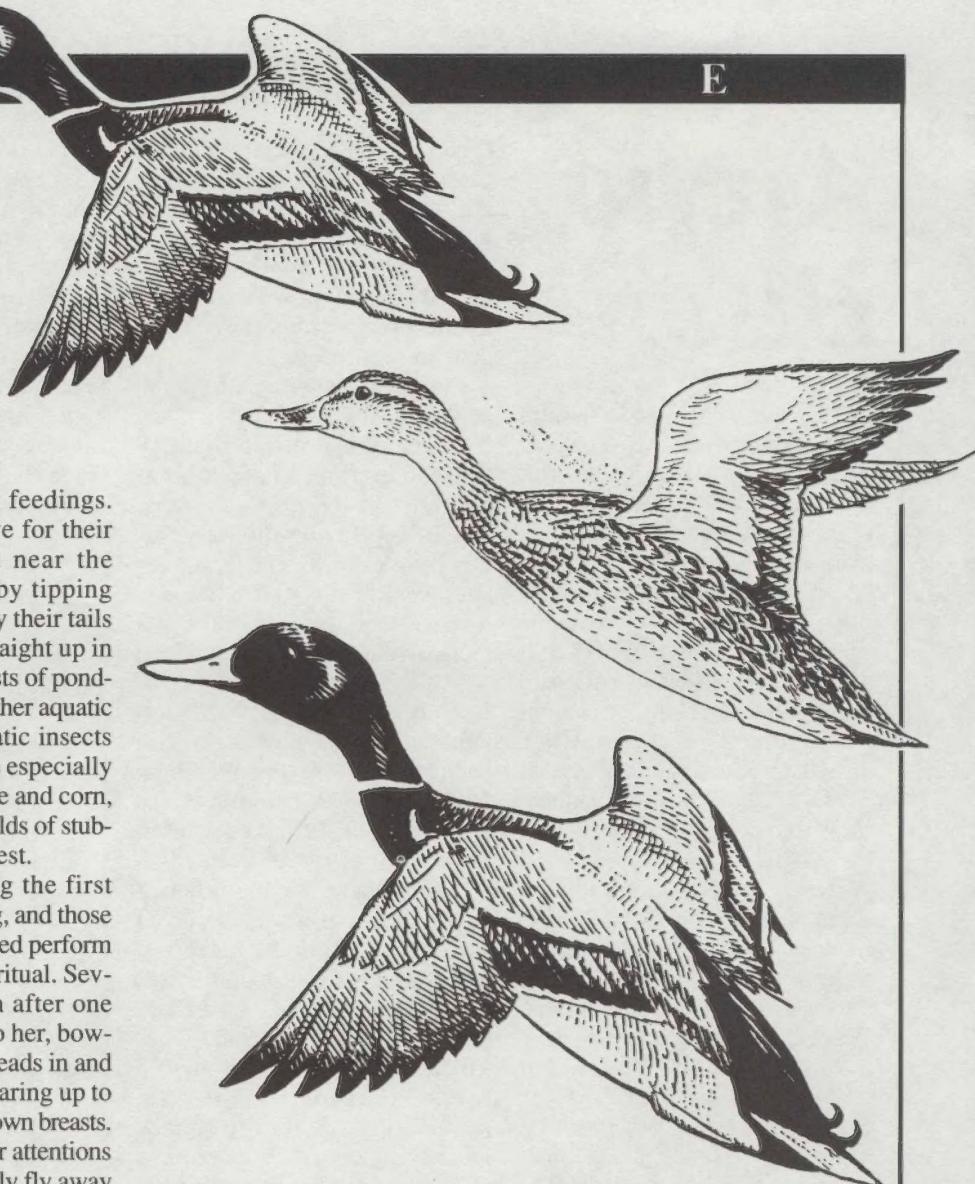
This discovery, if confirmed by additional discoveries, suggests that the flowering plants began as small plants with diminutive reproductive

Mallard is the more vocal of the two. It is usually her loud "quack-quack-quack" that is heard during

morning and evening feedings. Unlike ducks who dive for their food, Mallards feed near the surface of the water by tipping bottoms-up so that only their tails are visible, sticking straight up in the air. Their diet consists of pond-weeds, bulrushes and other aquatic plants, as well as aquatic insects and molluscs. They are especially fond of grains, wild rice and corn, and are often seen in fields of stubble after a prairie harvest.

Mallards are among the first ducks to arrive in spring, and those that are not already paired perform an elaborate courtship ritual. Several drakes may swim after one female, then sidle up to her, bowing and bobbing their heads in and out of the water, and rearing up to display their chestnut-brown breasts. The female ignores their attentions at first, and may suddenly fly away with as many as three males in pursuit. Finally, she touches the suitor of her choice with her bill, and the two fly off together to find a nesting site.

The nest is well hidden in a shallow depression among grasses or rushes, usually near the edge of a pond or slough where the ground is fairly dry, although sometimes it is far from water. It is lined with grass and reeds, and softened with feathers and down from the female's breast.



The female usually lays between eight and 12 greenish or buff-white eggs, with the earliest clutches appearing in April. Shortly after the eggs are laid, the male leaves his mate and joins other drakes to spend the summer moulting period hiding in reeds.

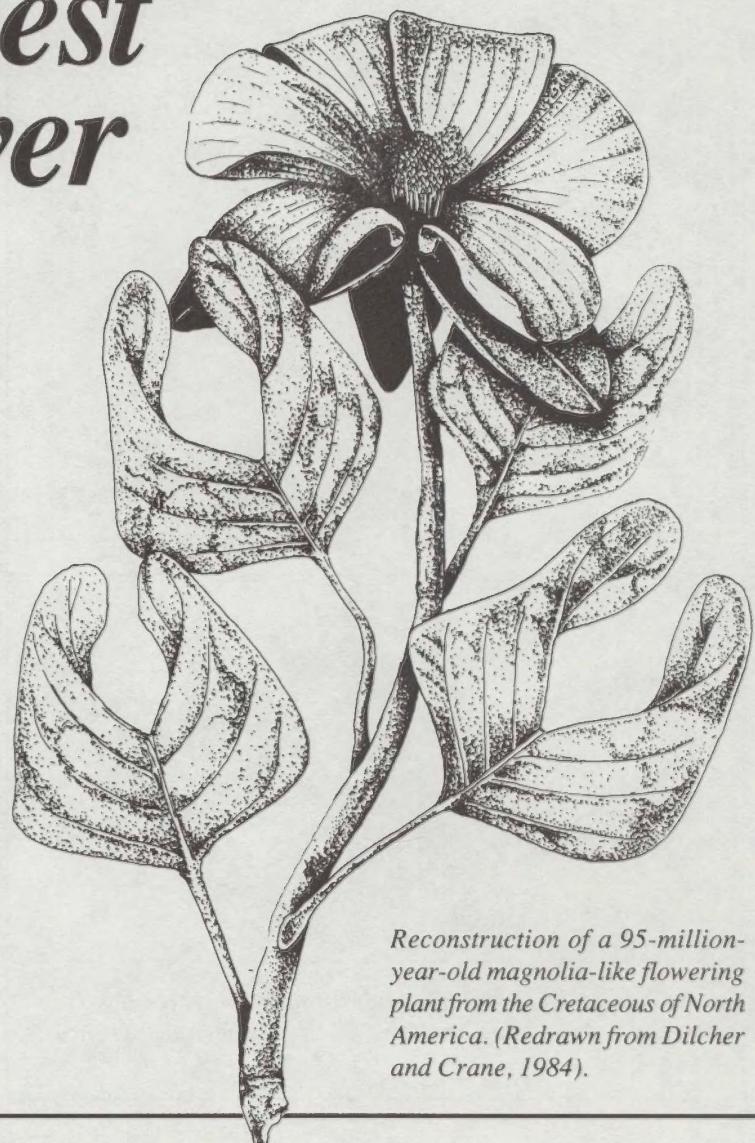
The incubated eggs hatch 28 days after the last egg is laid. When the ducklings are strong enough, the female leads them to the nearest water. This can be quite hazardous if the nest is far away,

but the mother Mallard is a courageous bird and takes great risks to defend her young.

In September, after the young have acquired their first flight plumage, flocks gather to feed and prepare for the long journey south. Hunters will soon be waiting for their passage, eager to get a shot at what they consider one of the finest game birds of North America.

Carol Thiessen
Exhibits Division

Searching for the Oldest Flower



Reconstruction of a 95-million-year-old magnolia-like flowering plant from the Cretaceous of North America. (Redrawn from Dilcher and Crane, 1984).

David M. Jarzen
Earth Sciences Division
(Paleobiology)

Arctic Bison

Bison originated in Eurasia and may have first entered North America by the "Bering Isthmus" about a million years ago, as indicated by fossils from near Fairbanks, Alaska. Perhaps these early migrants were similar in form and habits to the extinct large-horned bison (*Bison priscus*) that held sway in northern Eurasia and North America until about 10,000 years ago, when many large mammals characteristic of the ice age died out. Northern small-horned bison or western bison (*Bison bison occidentalis*) evidently replaced large-horned bison stock in Beringia (unglaciated areas of Siberia, Alaska and Yukon, including the exposed Bering Isthmus) about that time. Western bison presumably gave rise to wood bison (*Bison bison athabascae*) some 5000 years ago.

During the past two decades, intriguing evidence has come to light suggesting the presence of bison on the Arctic coast of Canada during the last 5000 years.

The first tantalizing evidence consisted of a partial hornsheath (the outer covering of a right horn) from the eastern shore of Baillie Islands — low, windswept islands off Cape Bathurst, just east of the Mackenzie Delta (no. 1 on map). The specimen, collected by geologists John Fyles and Vern Rampton in 1969, represented a species of bison, but what kind I could not determine. The surprising thing about the hornsheath, apart from the fact that it is the northernmost ($70^{\circ}35'N$) record of bison in

Canada, is that it yielded a radiocarbon date of about 1800 years B.P. ("before present" or 1950), when commercial radiocarbon dating became available. Was something wrong with the date? Could the specimen have been contaminated?

Further light was shed on the problem in 1984 when Bob McGhee asked me to identify three bones from an archaeological site on the north shore of Harrowby Bay on the Beaufort Sea coast, approximately 40 km southeast of the Baillie Islands locality. One was a partial bison metacarpal (upper forefoot bone), which again could not be identified to species. In 1988, Bob informed me that the fragment had been radiocarbon dated to about 5200 years B.P. The plot thickened, but I still did not know what kind of bison was represented.

The answer became clearer when, soon afterward, I received for identification the back of a bison skull with horncores. It had been collected in 1987 by archaeologists Ray Le Blanc and Dave Morrison on the bank of Old Horton River Channel, some 48 km southeast of the Baillie Islands locality. The well-fused sutures (regions where bones of the skull join together as an animal grows older), the relatively short, robust horncores with well-defined burrs (rough areas at the bases of horncores), and the specimen's size indicated that it belonged to a smaller-than-average male wood bison. Several cut-marks on the upper surface of the skull showed that people had used it as a "cutting board." About a year ago, I received a radiocarbon date of approximately 420 years B.P. on a few grams of fresh bone cored from the specimen's interior.

Although wood bison were the last bison to occupy Alaska and

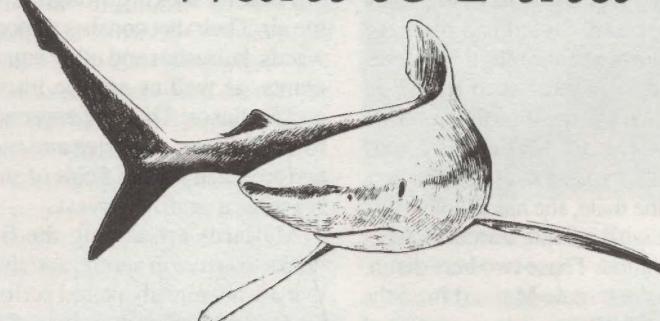
Yukon under natural conditions (there have been introductions since), none has before been reported from the Arctic coast of Canada. In fact, the recorded historic wood bison sites nearest to Cape Bathurst are more than 900 km southeast, in the vicinity of Lac la Martre (no. 2 on map). So the three specimens mentioned suggest that a population of wood bison lived near the Beaufort Sea coast between 5000 years B.P. and

the mid-1500s — perhaps about the time that Martin Frobisher first landed on Baffin Island (1576), and well before Samuel Hearne reached the mouth of Coppermine River (1771). Many questions arise from these finds. Could wood bison have originated in the Cape Bathurst region? What kind of climate and plantscape existed in this enclave during the last 5000 years? Perhaps future studies of fossil pollen will provide such

information. Why and exactly when did wood bison die out there? Could bison have survived to historic times in similar areas along the Arctic coast of Siberia? As usual with science, interesting finds lead to many more questions.

C.R. Harington
Earth Sciences Division
(Paleobiology)

Want to Find Out More?



A few facts from our new issues in the *Neotoma* series:

no. 25, Sharks of Canada

The second-largest shark in the world — the basking shark — is common in Newfoundland

no. 26, Hummingbirds and their Flowers

Found exclusively in the New World, hummingbirds live from Alaska to Tierra del Fuego.

Hummingbirds range in size from the world's smallest bird, the 2-g Bee Hummingbird of Cuba, to the Andean Giant Hummingbird that tips the scales at 20 g. Canada's smallest bird, the Calliope Hummingbird, weighs less than a dollar coin.

Holding the record for the most rapid heart rate among birds, hummingbirds also have the largest heart relative to body weight of any warm-blooded animal.



The nobles of Montezuma's court cloaked themselves in garments made of hummingbird skins. The Victorian era also took its toll, as nineteenth-century auction records indicate that hundreds of thousands of hummingbird skins were bought and sold for collections and ornamentation.

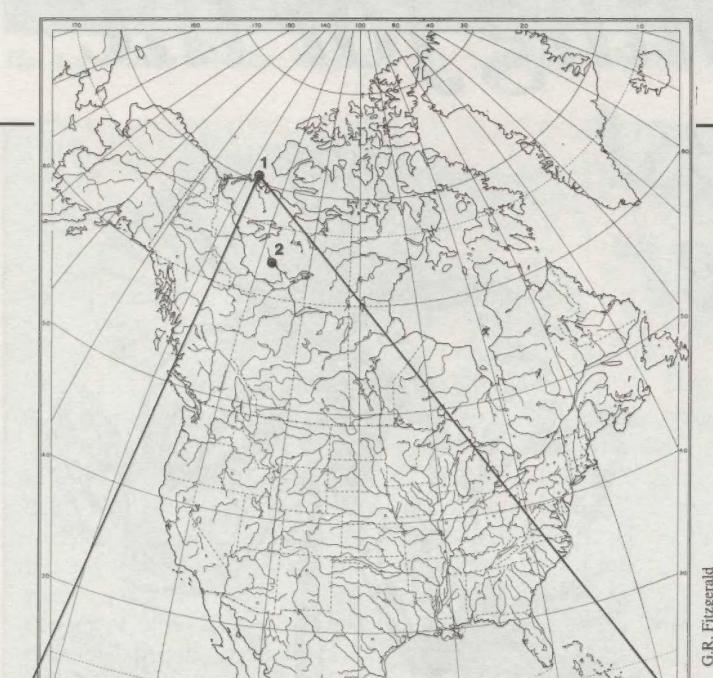
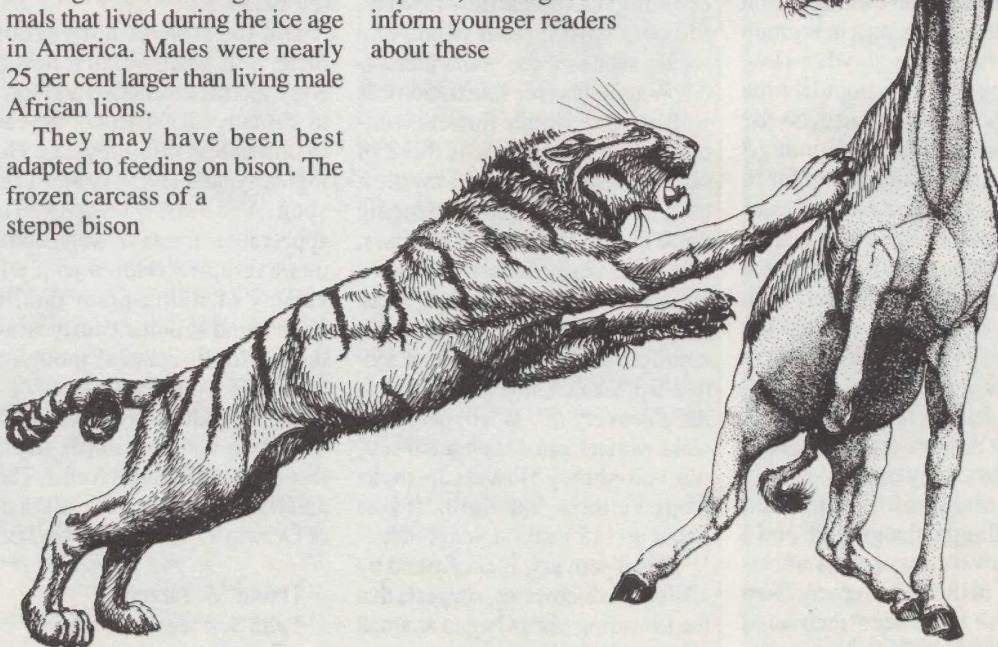
Curious creatures, hummingbirds are likely to investigate almost anything that is brightly coloured, from a watering can to a red sunhat.

found near Fairbanks, Alaska showed signs of having been killed by lions in early winter some 36,000 years ago.

If you want to find out more, write to the Museum Resource Centre for your free copies of these new *Neotoma* issues. Another new publication, *Naturama: Amphibians and Reptiles*, is designed to inform younger readers about these

mysterious and little-understood creatures. A list of our other free materials is available on request.

They may have been best adapted to feeding on bison. The frozen carcass of a steppe bison



Cranial fragment of a wood bison (*Bison bison athabascae*) from Old Horton River Channel. The pale area between the horncores was used by people as a cutting board.